express words as well as the general bent of his argument seemed to point in the opposite direction. Thus at p. 81 he writes:—"Language is a product of *association*. . . . Language is a product of an active, not of a passive, process; it is the child of *will*, not of sensation." The statement that language is "the child of will" seems to me practically identical with the assertion that "speech is the deliberate product of a conscious will," because the will here spoken of, being "an active process," is necessarily conscious.—A. H. KEANE.]

Notes on the Mode of Flight of the Albatross

WHEN watching the albatross one is struck with the fact that the bird gets up to windward without appearing to use his wings to a degree sufficient to account for the same. The sailors are satisfied with the explanation that he beats to windward. The conditions are of course not analogous to those of a ship sailing to windward. If the wind be very light, or if there be a calm, occasional powerful and obvious flapping of the wings occurs. If there is no wind, the birds often settle on the water round the ship. In very heavy weather the birds disappear altogether, probably settling on the water. Except that for breeding they resort to the islands, I believe they frequent the open ocean, where the surface is seldom without more or less swell.

On watching the flight of the albatross, one observes that in order to rise from the water violent and obvious flapping of the wings is necessary, which is continued some time after the wings cease to strike the water. After a start has thus been effected, if there is a fresh breeze, the wings are kept almost motionless. Sometimes the bird goes some distance with the impetus derived from the flapping of the wings at the start, but sooner or later he turns so as to expose the plane surface of his wings full to the force of the wind, rising at the same time some height above the water, and drifts off to leeward, thus soon acquiring the velocity of the wind; then swooping down into the hollow between two swells, he turns his head to windward, and keeping close to the surface of the water, sails along more or less against the wind for a surprising distance; finally, rising over the crest of a wave comparatively high into the air, and turning with his wings as before, so as to catch the wind to the fullest extent, he again lets himself drift off to leeward.

Thus the manœuvre he performs seems to consist in drifting with the wind in such a way as to attain its velocity very soon, and then turning round so as to make use of this velocity to carry him in the contrary direction.

Of course if he still remained exposed to the wind which had imparted to him its velocity he would not travel far against it before he came to a standstill, and he would certainly make no progress to windward; but by keeping close to the surface of the water, and as much as possible in the hollows between the waves, he is almost out of the wind; and in this comparatively calm region the impetus derived from the wind will carry him a long distance in exactly the opposite direction to that of the wind itself.

This manœuvre appears to be an important factor. No doubt the almost imperceptible movement of the wings may assist, though that this alone is insufficient to account for the progress to windward appears evident from the powerful efforts made with the wings in rising from the water and in calm weather. I have never had an opportunity to observe the albatross flying over land or over level water. If the manœuvre above described be an important factor, the birds then would have to use their wings much as they do in very light winds on the ocean. If very strong winds were blowing, they would have to settle on the land or in the water in order to remain at the locality.

ARTHUR W. BATEMAN

A General Theorem in Kinematics

PROF. EVERETT (*ante*, p. 99) has overlooked in the introductory paragraphs of Prof. Schell's paper, to which he refers for the original statement of the theorem re-discovered by Prof. Minchin, the acknowledgment: "Der Mittelpunkt der Beschleunigungen und jene beiden Kreise wurden bereits 1853 von BRESSE gefunden." The reference is to the *Journal de l'École Polytechnique*, tom. xx., "Mémoire sur un Théorème nouveau concernant les Mouvements Plans, etc." By means of the "two circles" Bresse determines the point c (J) "qui aura une accélération totale nulle" (p. 82), and then by very ingenious application of kinematic principles deduces those relations to it which any arbitrary point (P) has, as given by Prof. Minchin. Bresse names c "second centre instantané de rotation."

University Hall, December 4 J. J. WALKER

Geometrical Optics

YOUR correspondent "P. C." (NATURE, vol. xxii. p. 607) asks information concerning a work, in English or French, on geometrical optics, thoroughly explaining the optical construction of telescopes and microscopes. I am not aware of any such publication these last forty years, but deem it possible that it may interest your correspondent to know of the existence of such a work in German by von Littrow, entitled "Dioptrik, oder Anleitung zur Verfertigung der Fernröhre." It was published, I believe, in Vienna about 1838. W. G. LOGEMAN

High Burghal School, Haarlem, Holland, November 17

[Littrow's "Dioptrik" was published at Vienna in 1830 in 8vo.—ED.]

Ozone

IF a slip of the prepared paper, used for testing for atmospheric ozone, be carefully moistened on one side with alcohol, using a clean camel-hair brush, on burning off the spirit and immersing the slip of paper in water the paper changes to a deep purple colour, as deep as No. 8 in Negretti and Zambra's scale of colours for ozone.

Is this due to the development of ozone? as, according to Schönbein, heat destroys ozone. J. P.

Leicester, December 5

PLANTS OF MADAGASCAR

DURING the present year no less than four separate collections of plants have been received at Kew from Madagascar, including in the aggregate about a thousand species, represented by specimens complete enough to be botanically determinable. As the hills of the interior of the island attain an elevation of 10,000 feet, its range of climate is considerable. We now know not less than two thousand Madagascar flowering-plants, and probably have almost exhausted its ferns, to which the collectors have paid special attention, and which are about 250 in number, so that we may consider ourselves in a position to draw broad general conclusions as to the botany of the island.

Amongst the tropical types there are a considerable number of endemic genera. The lemurs find their parallel in the vegetable kingdom in the *Chlænaceæ*, a natural order whose nearest affinities are with *Tiliaceæ*, *Dipterocarpeæ*, and *Ternstromiaceæ*, which is strictly confined to Madagascar, and comprises four genera and about twice as many species, to which the Rev. R. Baron, in these new collections, has added a well-marked novelty in a second species of *Leptolæna*. Altogether there are certainly not less than fifty genera confined to the island, some of them very curious types, as *Dicoryphia* in *Hamamelideæ*, *Ouvirandra* in *Naiadaceæ*, *Asteropeia* (placed in the "Genera Plantarum" in *Samydaceæ*, but which Mr. Baron's excellent new specimens will most likely have to be removed to *Linaceæ*), *Macarisia* in *Rhizophoreæ*, *Deidamia* and *Physena* in *Passifloreæ*, *Hydrotriche* in *Scrophulariaceæ*, *Canetia*, *Tánnodia* and *Sphærostylis* in *Euphorbiaceæ*, *Pachnotrophe* in *Moreæ*, *Calantica* in *Samydaceæ*, and several each in the orders *Rubiaceæ*, *Melastomaceæ*, and *Compositæ*. To these endemic types the new collections add at last three, *Kitchingia*, a fine new genus of *Crassulaceæ* allied to *Bryophyllum*, with five or six species named after the collector of the first of the four parcels, *Rhodocodon*, a monotypic genus of gamophyllous *Liliaceæ* allied to *Hyacinthus*, and *Micronychia*, in *Anacardiaceæ*, also monotypic, figured lately in Hooker's Icones. Besides these the tropical flora of the island contains a large proportion: first, of endemic species of genera known elsewhere; second, of species

common to Madagascar, Mauritius and Bourbon, but not elsewhere known, such as *Pittosporum Senacia*, *Aphloia mauritiana*, *Gouania mauritiana*, *Nesœa triflora*, *Lobelia serpens*, and *Buddleia madagascariensis;* thirdly, of species that spread across Tropical Africa, such as *Haronga paniculata*, *Desmodium mauritianum* and *oxybracteum*, *Gynura cernua*, *Brehmia spinosa*, and *Mussoenda arcuata;* fourthly, of species spread universally through the tropics of the Old World, but not reaching America, such as *Crotalaria stricta*, *Oxalis sensitiva*, *Nymphœa stellata*, *Trichodesma zeylanica*, *Indigofera enneaphylla*, *Avicennia officinalis*, and *Rhizophora mucronata;* and fifthly, of species spread universally through the tropical zone of both hemispheres, such as *Eleusine indica Tephrosia purpurea*, *Drymaria cordata*, *Elephantopus scaber*, *Terammus labialis*, *Zornia dephylla*, *Waltheria americana*, *Sida rhombifolia*, and *Nephrodium molle*. In Mauritius and the Seychelles there are 145 species which occur also both in Asia and Africa, in addition to 225 which are spread all round the world in the tropical zone, and nearly all these 370 species are now known in Madagascar also. A small proportion of the Madagascar genera and species are Asiatic but not African, and these present collections add to the island flora *Lagerstromia*, *Buchanania*, and *Strongylodon*, three well-marked Indian types.

But perhaps still more interesting, in the light that it throws on the past history of the island, is the relationship of the comparatively limited flora of the mountains of the interior to that of othei parts of the world. A certain number of the plants, especially the ferns and fern-allies, are widely-spread temperate species, which now have their head-quarters in the temperate regions of the northern hemisphere; we have instances of this in *Nephrodium Filix-mas*, *Aspidium aculeatum*, *Osmunda regalis*, *Lycopodium claratum*, *L. complanatum*, *Sanicula europœa*, *Potamogeton oblongus*, *Sonchus asper*, *S. oleraceus*, *Polygonum minus*. Most of the characteristic types of the Cape flora are represented on the Madagascar mountains, but nearly always by species which are distinct from those which are now found in the extra-tropical regions of the main continent: for instance, the Aloes by a couple of species of *Eualoe;* the Heaths by several species of *Philippia* and *Ericinella;* the bulbous Iridaceæ by species of *Gladiolus*, *Geissorhiza* and *Aristea;* the saprophytic *Scrophulariaceœ* by *Harveya obtusifolia;* the special Cape ferns by *Mohria caffrorum*, *Cheilanthes hirta*, *Pellœa hastata*, and *P. calomelanos;* the Proteaceæ by the curious genus *Dilobeia* (which Du Petit Thouars found at the beginning of the century, and of which Dr. Parker has now sent home the first specimens which have been seen in England); and the *Selagineœ* by *Selago muralis* of Bentham, which grows in the grounds of the Queen's palace at Antananarivo. But perhaps the most interesting feature of all is the occurrence of several striking cases of specific identity between plants of the Madagascar mountains and those of the tropical zone of the African continent. The only Madagascar violet (*Viola emirnensis*, Bojer, = *V. abyssinica*, Steud.) only occurs elsewhere high up amongst the mountains of Abyssinia, at 7000 feet above sea-level in the Camaroons, and at 10,000 feet above sea-level at Fernando Po. The only Madagascar Geranium (*G. emirnense*, H. B. = *G. compar*, R. Br. = *G. simense*, *latistipulatum* and *frigidum*, Hochst.) has a precisely similar area of distribution. *Caucalis melanantha* of Bentham is only known in Madagascar and amongst the mountains of Abyssinia. The Madagascar *Drosera* (*D. madagascariensis*, D.C. = *D. ramentacea*, Burch.) reappears at the Cape and the mountains of Angola and the west tropical coast; *Agauria salicifolia*, Hook. fil., which we noted lately as having been gathered by Mr. Thomson on the high plateaux of Lake Nyassa, is found in the Cameroons and on the mountains of Madagascar, Mauritius, and Bourbon; *Crotalaria spinosa* reappears in Nubia, Abyssinia, Angola, and Zambesi-land; *Asplenium Mannii*, Hook., on the mountains of Zambesi-land, the Cameroons, and Fernando Po. As a whole, it would seem that the flora of the Madagascar mountains corresponds closely with that of the great ranges of the tropical zone of the main African continent.

J. G. BAKER

BENJAMIN COLLINS BRODIE, BART., F.R.S., D.C.L.

ON Wednesday, November 24 last, died Benjamin Collins Brodie the younger, a worthy son of a distinguished sire. Born to affluence, but early imbued with the liberal and high-minded views of the great surgeon, he determined to devote his life and energies to the prosecution of science for its own sake, and well has he done his work. Brodie was born in London in 1817, and educated first at Harrow under Longley, and afterwards at Balliol, taking his Master's degree in 1842. In those days it was absolutely impossible to carry out original chemical work at Oxford, and Brodie naturally betook himself to Giessen, where Liebig's name drew students from all parts of the world. There in the summer of 1845 Brodie, at Liebig's suggestion, carried out analyses of certain waxes obtained by Gundlach by feeding bees on different kinds of sugar. The results thus obtained led him to continue his examination of bees'-wax on his return to England, and from his private laboratory in the Albert Road now came forth his well-known researches on the Chemical Nature of Wax (*Phil. Trans.* 1848, 147-170; 1849, 91-108), for which in 1850 he received the well-merited reward of the Royal Medal. These researches will always remain not only remarkable as having given a successful solution of a difficult problem, but as having proved, by careful preparation and exact analysis, the existence in wax of solid bodies which play the part of alcohols, and of which common spirit of wine is a direct lineal descendant. This unexpected discovery of solid alcohols containing respectively twenty-seven and thirty atoms of carbon in the molecule completely confirmed the truth of the views concerning the existence of an homologous series of alcohols first enunciated by Schiel and Gerhardt, and thus placed in firm position one of the chief pillars of the organic portion of our science.

Brodie's next work was not inferior either in importance or in workmanship to his first. In 1850 he published his memoir "On the Condition of certain Elements at the Moment of Chemical Change" (*Phil. Trans.*, 1850, 750-804), in which he carefully investigates the remarkable reducing action exerted by peroxide of hydrogen. Not only does this body lose half its oxygen when brought in contact with oxide of silver, but reduces this oxide to metal. This anomalous action was satisfactorily explained by Brodie, who pointed out that the second atom of oxygen in these peroxides is not only retained in an unstable state of combination, but that when brought into contact with silver oxide a true synthesis of oxygen occurs, two atoms of this element uniting to form one molecule of free oxygen. That this reaction really takes place was shown by Brodie to be the case by careful experiment. These results led him to consider the constitution of the alcohol radicals (*Chem. Soc. Journ.* iii. 405), and to assert in 1851 the important fact, now universally admitted, that the molecule of the radical ethyl contains four atoms of carbon. To him too we owe the prediction of the possibility of the existence of the mixed radicals, a prediction so soon afterwards experimentally verified by Wurtz. Next we find him active as secretary of the Society of which he afterwards became president, viz. the Chemical Society of London; also in lecturing at the Royal Institution on the allotropic changes of certain elements, on the formation of hydrogen and its homologues, in which